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The relationship between quantity, type, and timing of external childcare and child problem behaviour in Switzerland

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Abstract

This study aimed to investigate the relationship between external childcare and child problem behaviour at age 7 in a culturally diverse urban sample from Switzerland. We used data from the Zurich Project on the Social Development of Children (*z-proso*). Findings suggested that the quantity of group-based childcare (but not individual childcare) was related to aggression, ADHD, non-aggressive externalizing behaviour, and anxiety and depression at age 7. Analyses on timing of childcare suggested that the accumulation of childcare over the life-course, and not so much childcare in the first years of life, was associated with child problem behaviour. In addition, childcare at age 5 to 7 had a unique relationship with problem behaviour over and above quantity of group-based childcare received in other age periods.

Keywords: child problem behaviour, external childcare

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In economically advanced countries, around 25% of children under the age of three and around 80% of 3- to 6-year-olds attend some form of early education and childcare (UNICEF, 2008). Due to women's entrance into the labour force, external childcare has become increasingly common. Scholars have become interested in the possible effects of external childcare, examining whether and how it influences child behaviour. Most of this research is from the United States (e.g. Bacharach and Baumeister, 2003; Bates et al., 1994; McCartney et al., 2010; NICHD Early Child Care Research Network, 2003a). In contrast, with the notable exception of the United Kingdom, little research has been conducted on the topic in Europe. This study contributed to filling this gap by examining the relationship between quantity, type, and timing of external childcare and child problem behaviour in Switzerland. We are aware that variation in the quality of childcare is also important for behavioural outcomes (Burchinal & Cryer, 2003; European Child Care and Education (ECCE) – Study Group, 1999; NICHD Early Child Care Research Network, 2002, 2003b; Schüpbach, 2010). In the current paper, we did not focus on childcare quality since due to the nature of the data collection, we did not have information on this. Moreover, prior research has suggested that the relationship between childcare quantity and behaviour cannot be accounted for by childcare quality (NICHD Early Child Care Research Network, 2003a).

Prior research has shown that quantity, type, and timing of external childcare are related to child behaviour. One of the best known studies is the US National Institute of Child Health and Human Development Study of Early Child Care. Amongst others, it found that *quantity* (number of hours) of external childcare was significantly related to higher externalizing behaviour (Belsky, 2007; Belsky et al., 2007; McCartney et al., 2010; NICHD Early Child Care Research Network, 2003a). However, the effect sizes of childcare were modest compared to family characteristics. The relationship became weaker over age: while it significantly predicted externalizing behaviour at age 4.5, it did not in grade six. In other US research, Bates et al. (1994) found that the amount of

childcare received predicted child adjustment problems at age 5 although effect sizes were small. In contrast, Bacharach and Baumeister (2003) found no evidence for an association between quantity of external care and severe externalizing behaviour among kindergarten children beyond selection factors. In some studies, *type* of childcare has been shown to matter. Having spent more time in childcare centres, but not in care provided by a non-relative in a home or care by a relative, increased problem behaviour at 54 months of age (NICHD Early Child Care Research Network, 2004) and in sixth grade (Belsky et al., 2007). In terms of *timing*, it has been argued that particularly childcare in the first year of life may have negative consequences because infants are more dependent on their parents (Brooks-Gunn, Han, & Waldfogel, 2010). This was not supported by NICHD research (NICHD Early Child Care Research Network, 2003a), although prior research reported that mother's employment in the first year matters (Han, Waldfogel, & Brooks-Gunn, 2001). Furthermore, evidence has suggested that especially the continuity of external childcare after the first year predicts later behavioural problems (Bates et al., 1994; NICHD Early Child Care Research Network, 2003a; but see Harvey, 1999 for a study that did not replicate this pattern).

At least two mechanisms may account for a relationship between external childcare and problem behaviour. The first is based on attachment theory (Bowlby, 1969). It assumes that external childcare threatens safe child-parent attachment through the separation of the child from the mother, and thereby increases developmental risks. This may be especially relevant for children who attend day-care in their first year of life (Belsky & Rovine, 1988). Findings have shown that early external childcare is related to insecure attachment, but only in situations of maternal insensitivity (NICHD Early Child Care Research Network, 1997a, 2001). Research on attachment security has been criticised on methodological grounds (e.g. Clarke-Stewart, 1989, but see Belsky, 2001). However, related research has more broadly assessed the relationship between external childcare and mother-child interactions. Two recent studies suggested that external childcare is related to less positive mother-child interaction (Clark, Hyde, Essex, & Klein, 1997; NICHD Early Child Care Research Network, 1999).

A second mechanism focuses on the social environment of external childcare. External childcare, especially in childcare centres, is generally characterised by the presence of other children. Although peers may reduce the likelihood of problem behaviour by providing negative feedback to problem behaviour (Field, 1991), peer relationships are not always beneficial (Boivin, Vitaro, & Poulin, 2005). Research has suggested that behaviour in childcare settings is 'contagious', with children learning and imitating problem behaviours from peers (Goldstein, Arnold, Rosenberg, Stowe, & Ortiz, 2001). Furthermore, the presence of other children also means that children have to share their caregivers' attention. As a result, children may display externalizing behaviour in order to be noticed.

In spite of these arguments, external childcare may also be beneficial for child development through its association with more maternal employment and higher income (Joshi & Verropoulou, 2000; Waldfogel, 2002), although recent research did not find evidence for this (Brooks-Gunn, Han, & Waldfogel, 2002). Moreover, external childcare may be especially beneficial for children from particular backgrounds: External childcare functions as a buffer against problem behaviour for children from less advantaged backgrounds (Burchinal, Roberts, Zeisel, Hennon, & Hooper, 2006; Côté, Borge, Geoffroy, Rutter, & Tremblay, 2008; Edelmann, 2009; Peisner-Feinberg et al., 2001; Stamm, 2010).

There exist differences between countries in how childcare is provided and what groups are likely to use it (UNICEF, 2008). Evidence from the US context, where most research has been conducted, may not generalize to other countries (Waldfogel, 2002). For example, while children seemed to benefit from external childcare in Sweden (Andersson, 1989, 1992), childcare in Texas was linked to detrimental outcomes (Vandell & Corasaniti, 1990). Potential explanations focus on the minimal childcare standards in Texas as compared to the high standards in Sweden (Vandell, 2004; Vandell & Corasaniti, 1990). Important European studies were published by Joshi and Verropoulou (2000), Sammons et al. (2007), Melhuish et al. (2006), and Andersson (1989; 1992). In a British study, Joshi and Verropoulou (2000) found that maternal employment below age 5 had

no relationship with child aggression and anxiety. In England, Sammons et al. (2007) found that children who attended centre-based childcare below age 2 had higher levels of antisocial behaviour at entry into primary school than children who stayed at home. This relationship disappeared at age 10. In Northern Ireland, Melhuish et al. (2006) found that children who attended a playgroup, private day nursery, or reception class had significantly higher levels of conduct problems at age six than children who did not.

In light of the need for country-specific research, the current paper focused on the city of Zurich, Switzerland. Switzerland recently received poor marks on its childcare services (UNICEF, 2008). A comparatively small percentage of the Gross Domestic Product is spent on publicly supported childcare provision and the national government has been criticised for its failure to devise a comprehensive national strategy that provides high-quality childcare services to all families. The high costs associated with external childcare and the insufficient number of childcare arrangements led mothers to lower their employment involvement (MecoP/INFRAS, 2007). A mix of private and public childcare provision is coordinated by local councils, and provision varies widely between places. In Zurich, centre-based childcare expanded greatly since the early 1990s (Stadt Zürich, 2010).

To our knowledge, only one Swiss study has been conducted on the association between external childcare and problem behaviour. Pierrehumbert, Ramstein, Karmaniola, and Halfon (1996) found no evidence for an independent relationship between amount of childcare and problem behaviour at age 5; rather, the relationship was mediated by attachment to the mother. Type of care mattered: Collective care was related to higher externalizing behaviour than family-based care. However, the study was limited by its low response rate (30%), its low number of participants (n = 40), and the limited amount of control variables.

We investigated the following research questions: First, what is the relationship between the amount of external childcare since birth and problem behaviour at age 7; second, what is the relationship between the type of external childcare and problem behaviour, and third, what is the

relationship between the timing of external childcare and problem behaviour? Prior research has shown that entrance into childcare is not random, and related to such factors as income, parental education, ethnicity, parental values, and household composition (Clarke-Stewart, Gruber, & Fitzgerald, 1994; NICHD Early Child Care Research Network, 1997b). We therefore controlled for possible confounds in our analyses. Nonetheless, as in all non-experimental studies, we cannot exclude the possibility that unmeasured confounding factors may be responsible for relationships found.

Data

We used data from the first wave (age 7) of the Zurich Project on the Social Development of Children (*z-proso*) (Eisner & Ribeaud, 2005, 2007). The target population of the study consisted of all 2,520 children who entered the first class of public primary school in 2004 in Zurich. Sampling was based on a cluster randomised approach, with schools as randomisation units. All 90 public primary schools in Zurich were first classified by school size and socio-economic background. Subsequently, a stratified sample of 56 schools was drawn. The target sample of the study comprised all 1,675 children who started primary school in the 56 selected schools. A total of 1,225 parents (73%) agreed to participate in the initial interview. Data were obtained from the parent, child, and teacher.

Dependent variables

We examined the relationship between external childcare and four child behaviour domains: Aggression (AGGR), ADHD, non-aggressive externalizing behaviour (NAEX), and anxiety and depression (ANXDEP). All measures were derived from the Social Behaviour Questionnaire (SBQ; Tremblay et al., 1991), which is similar to the Child Behaviour Check List (Achenbach & Ruffle, 2000). The SBQ has been used in various developmental studies (e.g. Lösel, Beelmann, Stemmler, & Jaursch, 2006; Pagani, Japel, Vaillancourt, Côté, & Tremblay, 2008; Tremblay, Pihl, Vitaro, & Dobkin, 1994). Tremblay et al. (1991) found internal consistency and test-retest reliability of the SBQ, and stability over time (see also Pagani et al., 2008; Tremblay, Vitaro, Gagnon, Piché, &

Royer, 1992). Tremblay et al. (1992) showed SBQ items to have concurrent and predictive validity. The SBQ is adapted from the Preschool Behavior Questionnaire (Behar & Stringfield, 1974), which is a modification from the Children's Behaviour Questionnaire (Rutter, 1967), and the Prosocial Behavior Questionnaire (Weir & Duveen, 1981).

The SBQ was administered to the parent, teacher, and child. Responses from the parents and teachers were recorded on a 5-point Likert scale. The children were shown drawings of a child's specific acts and asked whether they sometimes do what is shown. A yes/no format was used so that it would be easily understood by 7-year-olds. Assessments were based on the Dominique Interactif, which has been shown to have adequate reliability and validity for young children (Linares Scott, Short, Singer, Russ, & Minnes, 2006; Shojaei et al., 2009; Valla, Bergeron, Bérubé, Gaudet, & St-Georges, 1994; Valla, Bergeron, & Smolla, 2000). Scores were z-standardised for each informant and averaged across informants to construct one overall score (Table 1): The AGGR scale includes physical, proactive, and reactive aggression (11-12 items per informant); the ADHD scale consisted of 8-9 items per informant; NAEX combined non-aggressive conduct disorder and opposition and defiance (6-9 items); ANXDEP consisted of 7-9 items. Internal consistencies for these scales ranged from .68 to .79 for the parents, .81 to .94 for the teacher, and .58 to .72 for the child.

As usual for multi-informant behavioural assessment (Achenbach, McConaughy, & Howell, 1987), cross-informant correlations yielded low scale reliability at .36 (AGGR), .44 (ADHD), .39 (NAEX), and .22 (ANXDEP)[i]. This can be explained through the different contexts informants made their observations in, and different interpretations of behaviour. Combining scores of all three informants is generally believed to yield the most valid and reliable estimates of problematic child behaviour (Bank, Dishion, Skinner, & Patterson, 1990; Perren, Von Wyl, Stadelmann, Bürgin & Von Klitzing, 2006; Verhulst, Koot & Ende, 1994). Our main dependent variables are therefore the cross-informant variables. We report additional analyses for separate informants.

Main predictor

Information on childcare was obtained through an Event History Calendar (EHC). EHCs are increasingly popular instruments especially developed to elicit information about time-ordered life events. EHCs are better at retrieving memory of life events than traditional questionnaires, because EHCs encourage sequencing and parallel retrieval of events (Belli, 1998; Caspi et al., 1996). In the *z-proso* study, the EHC was included in the Wave 1 parent interview, usually completed by the mother (in 94% of cases). It documented events in the first seven years of the child's life. The EHC is designed as a large grid with rows (thematic domains, e.g. childcare arrangements) and columns (the time periods; three months). The EHC is organised top-down, with the most easily recalled themes mentioned first (e.g. household composition, residential history), followed by more difficult ones. By addressing the interrelatedness of events, isolated events are more likely to be remembered and inconsistencies across domains can be addressed.

Eisner et al. (2009) investigated the criterion validity of the *z-proso* EHC and found concurrent and discriminant validity of the variables. They concluded that risk factors measured in the EHC 'are correlated with behaviour outcomes in the expected direction, that the size-order and relative importance of early risk factors are in line with the previous literature, that longer exposure is associated with an added risk, and that the likelihood of problematic outcomes is related to cumulative contextual risk' (Eisner et al., 2009, p. 156). Examining household composition, Murray (2007) concluded that agreement between the EHC and the regular Wave 1 data ranged between 92% and 96%.

For all quarters up to the start of primary school, respondents estimated how many days per week a child received external childcare and whether the childcare arrangement was individual or group-based. Our final measure was computed by summing the number of days of childcare received across all quarters, divided by the total number of quarters. It therefore measured the average number of days per week of external childcare. Individual external childcare included childcare provided by non-cohabiting family members, neighbours or acquaintances, and day-care mothers (M = .56, SD = 1.06). Group-based external childcare included childcare in day-care

centres and schools (during after-school hours, not including regular kindergarten itself) (M = .76, SD = 1.06). Total childcare combined individual and group-based childcare (M = 1.32, SD = 1.43).

Control variables

We included three types of control variables: Characteristics present at birth, life events during the first seven years of life, and demographic and family characteristics at age 7. Regarding characteristics present at birth, we included measures for sex (*male* = 1), *single parenthood*, *age of the mother at birth of the child*, *alcohol consumption by the mother during pregnancy*, and *migrant background* (both or a single caregiver born outside of Switzerland). Regarding life events, we included *parental separation* (after birth), *parental criminality* (having been a crime suspect), *maternal depression* (extended periods of feeling depressed, unhappy, or overburdened) and *financial difficulties* (periods of substantial financial difficulties). Regarding demographic and family characteristics, we included *presence of siblings*, *household income*, *parental education* (highest educational level by either of both caregivers), *parental conflict* (periods of serious conflict among caregivers), and *negative parenting*. The latter comprised poor monitoring, erratic parenting, and corporal punishment (α = .65; see Shelton, Frick, & Wootton, 1996). Table 2 presents summary statistics.

Analytic strategy

Analyses focused on estimating the association between the amount, type, and timing of lifetime childcare experiences on problem behaviour at age 7. First, we assessed the relationship between amount of childcare and problem behaviour at age 7. We then separated amount of childcare into individual-based and group-based childcare. In a subsequent step, we added control variables. Finally, we analysed whether timing of childcare was associated with problem behaviour. We report results from ordinary least squares (OLS) regressions. Results of additional analyses on logarithmic and categorical transformations of the dependent variables were very similar. Average lifetime quantity of childcare was the main predictor. Additional analyses investigated the presence of curvilinear relationships (e.g. McCartney et al., 2010; Vandell, Belsky, Burchinal, Steinberg,

Vandergrift, & NICHD Early Child Care Research Network, 2010). Squared group-based childcare was found to be associated with ANXDEP and was included for this dependent variable.

Two types of missing values occurred. First, for some quarters for some respondents, interviewers failed to record the number of days on which children received external childcare, although they did note *that* they received childcare. This occurred for 94 children (7.7%). However, these missing quarters occurred for only a subset (namely 0.76%) of all quarters. We did not find evidence that respondents for whom at least one of the quarters was missing differed significantly from respondents without any missing quarters who received childcare on the dependent variables or on the other predictors, except that their caregivers reported less maternal depression and lower income, and were more likely to have a migrant background.[ii] Missing quarters were imputed with the mean of the subgroup of children who received childcare during the same quarter.[iii]

Second, missing data occurred in the control variables. All but one of the control variables had less than 2% missing values. Income contained 8% missing values. The pattern of missing data was not missing completely at random (Little's MCAR Test: χ^2 (136) = 251.14, $p < .001$). Mothers who failed to report income had somewhat lower educational attainment, were less likely to have a migrant background, less likely to have drunk alcohol during pregnancy, and had slightly lower age at the time of childbirth. We performed analyses using listwise deletion, EM-imputation, and multiple imputation, but obtained very similar results on the main predictors. We report results from analyses using listwise deletion.

We estimated the regressions with robust standard errors that are corrected for clustering within schools and for heteroskedasticity in the dependent variables.

Results

Tables 3 to 6 present three models for each dependent variable. Model 1 included only the amount of external childcare. Model 2 included type of childcare. Model 3 added control variables.

Models 1 show that the amount of external childcare was related to higher levels of all problem behaviours. Models 2 show that this was primarily due to group-based childcare, except for

ANXDEP, which was also related to individual childcare. In Models 3, we added control variables. The association between group-based childcare and problem behaviour held, but the size of the coefficients was reduced. For example, if the mean number of days at which childcare was received increased by one over the past seven years, AGGR increased by .092, which can be interpreted as a small increase given the range of AGGR (Table 1). The beta coefficients suggest that some control predictors (sex, negative parenting) were stronger predictors of behaviour than childcare. However, external childcare was a stronger predictor for problem behaviour (especially AGGR) than several other established risk factors, such as parental separation, single parenthood, and income.

We performed additional analyses that included an interaction term between childcare and sex of the child. We found no significant differences for girls and boys.

We also performed additional analyses for separate informants (Appendix 1). Overall, group-based external childcare had the strongest relationship with teacher-reported problem behaviour.[iv]

For purposes of interpretation, Table 7 presents adjusted means of problem behaviour for four categories of quantity of childcare. The construction of the four categories was to some extent arbitrary, but reflected the distribution of the childcare variables. Results show the same relationships as presented before, with problem behaviour increasing as the quantity of childcare increased (with a curvilinear relationship for ANXDEP), although the increases were small.

We also investigated whether quantity of group-based childcare was associated with levels of problem behaviour that may be considered high, using the strategy proposed by the NICHD (2003a). For each type of problem behaviour, we computed dichotomous variables with a 1 for children who scored more than 1 SD above the mean of problem behaviour, and with a 0 for other children, corresponding to cut-offs between the 82nd and 84th percentile. Adjusted proportions from logistic regressions show that the proportion of high-rate children increased as childcare increased (Table 8). Increases were notable between the extreme categories of childcare. The increase was strongest for AGGR and was curvilinear for ANXDEP. However, in line with NICHD (2003a),

even among children who were in group-based childcare more than 2.5 days per week, the large majority was not in the high-rate range.

Our final analyses focused on timing of childcare (Table 9). We restricted the analyses to group-based childcare. We disaggregated the amount of group-based childcare into separate variables for four age-blocks: the first year ('age 0', M = .17, SD = .64), age 1 to 2 (M = .62, SD = 1.19), age 3 to 4 (M = 1.11, SD = 1.48), and age 5 to 7 (M = .85, SD = 1.51). Following the method outlined by the NICHD (2003a), we present two different analyses. First, we included predictors that presented the cumulative effect size of childcare over overlapping periods, with each period entered in a separate model. In the first model, we entered only the amount of childcare in the first year ('age 0'). In the second model, we entered the amount of childcare at ages 0 to 2. In the third model, we entered the amount of childcare at ages 0 to 4. In the fourth model, we entered the amount of childcare at ages 0 to 7. The results in the upper half of Table 9 show significant results for AGGR, ADHD, and NAEX. The predictive power of group-based childcare increased when we considered longer periods of time. E.g. the standardised coefficients for childcare from ages 0 to 7 were larger than for childcare from ages 0 to 4, which in turn were larger than for childcare from ages 0 to 2.

Second, we investigated whether childcare received in a specific age-period had a unique relationship with problem behaviour that was not shared with childcare in other age-periods (NICHD, 2003a). As the NICHD team explained, significant coefficients of certain age-periods do not necessarily mean that these periods are stronger predictors: 'Other periods may actually be stronger predictors, if considered alone, but because they share their predictive power with other periods, that shared predictive power is accorded to no particular period in the analyses' (NICHD, 2003a, p. 995). We obtained two significant results, indicating that quantity of group-based childcare at age 5 to 7 had a unique relationship with AGGR and NAEX over and above the quantity of childcare received in other age periods.

Discussion

More than 20 years ago, studies in the US first suggested that the amount of external childcare is associated with increased child problem behaviour. Several studies have replicated the pattern in the US and the UK, but not in Sweden. Little research on the issue has been conducted in continental Europe. The current paper contributed to filling this gap by examining a Swiss sample of children.

First, the findings suggest a bivariate association between the life-time quantity of childcare and four behavioural problems, namely aggression, ADHD, non-aggressive externalizing behaviour, and anxiety and depression at age 7. When control variables were included, the relationship between group-based childcare and problem behaviour held, but the size of the coefficients was reduced. The findings suggest a linear dose-response relationship for aggression, ADHD, and non-aggressive externalizing behaviours in that more external childcare was associated with more problem behaviour. A curvilinear association was found for anxiety and depression. We are unable to provide a good explanation for this latter pattern.

Second, the results suggest that the association between external childcare and problem behaviour is due to group-based childcare and not to individual-based childcare. This suggests that group dynamics or the caregiver-to-child ratio may play an important role (see also McCartney et al., 2010). In contrast, the findings do not support the attachment theory argument that the absence of the mother is the main causal factor.

Third, results suggest that the accumulation of childcare over the life-course, instead of childcare in the first years of life, is associated with problem behaviour. The results also suggest that childcare at age 5 to 7 has a unique relationship with problem behaviour over and above group-based care received at other ages. There are two potential explanations. First, the levels of childcare received longer ago may have been recollected less accurately than more recent ones. Second, the data may suggest that the relationship between external childcare and problem behaviour exists primarily in the short-term. There is prior evidence for this (Belsky et al., 2007; Egeland & Hiester, 1995).

An important issue for consideration is the practical significance of these findings. One way of considering this is through standardised beta coefficients, which suggested that external childcare was a weaker predictor of problem behaviour than negative parenting or sex, but a stronger predictor than established risk-factors such as single parenthood, parental separation, and income. Unstandardised regression coefficients suggested that one additional day of group-based childcare was associated with an increase of about 0.14, 0.07, and 0.09 standard deviations in aggression, ADHD, and non-aggressive externalizing behaviour, respectively.[v] This suggests a small effect size. In contrast, results suggested substantial increases when children with high problem behaviour scores (more than 1 SD above the mean) were compared, and when the comparison was conducted between extreme categories (less than half a day vs. more than 2.5 days of childcare). In particular, the percentage of children with elevated levels of aggression was almost 3 times higher amongst the frequent external childcare group in comparison to the least frequent external childcare group. Although differences were smaller for the other behavioural domains, they still qualify as substantively relevant. Furthermore, as Belsky (2001, p. 856) observed, 'it must be remembered that more and more children seem to be spending more and more time at younger and younger ages in nonmaternal care arrangements in the English-speaking, if not Western, world. This means that even small effects, when experienced by many children, may have broad-scale consequences.'

The findings of this study for Switzerland are remarkably consistent with Anglo-American research (Belsky et al., 2007; Melhuish et al., 2006; Sammons et al., 2007), but not with research from Sweden (Andersson, 1989, 1992). The difference in findings between the US and Sweden has been explained by the difference in childcare quality (Vandell, 2004; Vandell & Corasaniti, 1990). Switzerland recently received poor marks on its childcare services (UNICEF, 2008). Recent qualitative research in childcare centres in Zurich found that the quality of care for small children varied notably (Widmer, Gabriel, & Grubenmann, 2009). Therefore, we cannot exclude the possibility that the present findings are mediated by quality of childcare. However, NICHD results

indicated that the relationship between quantity of childcare and problem behaviour is not accounted for by quality of childcare (NICHD Early Child Care Research Network, 2003a).

The present study had several limitations: First, it did not comprise data on the quality of external child-care. Therefore, it was impossible to establish whether childcare quality moderated the relationship between external childcare and problem behaviour. Second, the data on external childcare were collected retrospectively using an EHC. Although EHCs are better at retrieving memory of life events than traditional questionnaires, we cannot exclude the possibility that recall was imprecise. Third, our study was not experimental. Although we included a large number of confounding factors, we cannot be sure that the remaining relationships are more than correlational. Finally, the present study only examined behaviour outcomes in the first year of primary school. Several studies suggested that the association between external childcare and problem behaviour may disappear over time. Further research should therefore examine whether the association persists through primary school or whether it disappears over time.

References

Achenbach, T. M., McConaughy, S. H., & Howell, C. T. (1987). Child/adolescent behavioral and emotional problems: Implications of cross-informant correlations for situational specificity. *Psychological Bulletin, 101*, 213-232.

Achenbach, T. M. & Ruffle, T. M. (2000). The Child Behavior Checklist and related forms for assessing behavioral/emotional problems and competencies. *Pediatrics in Review, 21*(1), 265–271.

Andersson, B.-E. (1989). Effects of public day-care: A longitudinal study. *Child Development, 60*(4), 857–866.

Andersson, B.-E. (1992). Effects of day-care on cognitive and socioemotional competence of thirteen-year-old Swedish schoolchildren. *Child Development, 63*(1), 20–36.

Bacharach, V. R., & Baumeister, A. A. (2003). Child care and severe externalizing behavior in kindergarten children. *Applied Developmental Psychology, 23*, 527–537.

Bank, A. M., Dishion, T. J., Skinner, M. L., & Patterson, G. R. (1990). Method variance in structural equation modeling: Living with 'glop'. In G. R. Patterson (Ed.), *Depression and Aggression in Family Interaction* (pp. 247–279). Hillsdale, NJ: Lawrence Erlbaum Associates.

Bates, J. E., Marvinney, D., Kelly, T., Dodge, K. A., Bennett, D. S., & Pettit, G. S. (1994). Child-care history and kindergarten adjustment. *Developmental Psychology, 30*(5), 690–700.

Behar, L., & Stringfield, S. (1974). A behavior rating scale for the preschool child. *Developmental Psychology, 10*(5), 601–610.

Belli, R. F. (1998). The structure of autobiographical memory and the event history xalendar: Potential improvements in the quality of retrospective reports in surveys. *Memory, 6*(4), 383–406.

Belsky, J. (2001). Emmanuel Miller Lecture. Developmental risks (still) associated with early child care. *Journal of Child Psychology and Psychiatry, 42*, 845–859.

Belsky, J. (2007). *Quality, Quantity and Type of Child Care: Effects on Child Development in the USA.* Paper presented at the Early Childhood Education: International Perspectives, Potsdam, Germany.

Belsky, J., Vandell, D. L., Burchinal, M., Clarke-Stewart, K. A., McCartney, K., Owen, M. T., et al. (2007). Are There Long-Term Effects of Early Child Care? *Child Development, 78*, 681–701.

Belsky, J., & Rovine, M. J. (1988). Nonmaternal care in the first year of life and the security of infant-parent attachment. *Child Development, 59*(1), 157–167.

Boivin, M., Vitaro, F., & Poulin, F. (2005). Peer relationships and the development of aggressive behaviour in early childhood. In Tremblay, R. E., Hartup, W. W., & Archer, J. *Developmental Origins of Aggression,* pp. 376–397. New York: The Guilford Press.

Bowlby, J. (1969). *Attachment and Loss. Volume 1: Attachment*. London: The Hogarth Press.

Brooks-Gunn, J., Han, W-J-, & Waldfogel, J. (2002). Maternal employment and child cognitive outcomes in the first three years of life: The NICHD study of early child care. *Child Development*, *73*, 1052–1072.

Brooks-Gunn, J., Han, W-J., & Waldfogel, J. (2010). First-year maternal employment and child development in the first seven years. *Monographs of the Society for Research in Child Development, 75*, 1–147.

Burchinal, M., Roberts, J. E., Zeisel, S. A., Hennon, E. A., & Hooper, S. (2006). Social risk and protective child, parenting, and child care factors in early elementary school years. *Parenting: Science and Practice, 6*, 79–113.

Burchinal, M. R., & Cryer, D. (2003). Diversity, child care quality, and developmental outcomes. *Early Childhood Research Quarterly, 18*, 401–426.

Caspi, A., Moffitt, T. E., Thornton, A., Freedman, D., Amell, J. W., Harrington, H., et al. (1996). The life history calendar: A research and clinical assessment method for collecting

retrospective event-history data. *International Journal of Methods in Psychiatric Research, 6*, 101–114.

Clark, R., Hyde, J.S., Essex, M. J., & Klein, M. H. (1997). Length of maternity leave and quality of mother-infant interactions. *Child Development, 68,* 364–383.

Clarke-Stewart, K. A. (1989). Infant day care. Maligned or malignant? *American Psychologist, 44*, 266–273.

Clarke-Stewart, K. A., Gruber, C. P., & Fitzgerald, L. M. (1994). Children at Home and in Day Care. Hillsdale, N.J.: Lawrence Erlbaum Associates.

Côté, S. M., Borge, A. I., Geoffrey, M.-C., Rutter, M., & Tremblay, R. E. (2008). Nonmaternal care in infancy and emotional/behavioral difficulties at 4 years old: Moderation by family risk characteristics. *Developmental Psychology, 44*, 155–168.

Edelmann, D. (2009). Frühe Förderung von Kindern aus Familien mit Migrationshintergrund – von Betreuung und Erziehung hin zu Bildung und Integration [Early enhancement for children from families with a migration background – from care and child-rearing to education and integration]. In M. Stamm & D. Edelmann (Eds.), *Frühkindliche Bildung, Betreuung und Erziehung. Was kann die Schweiz lernen?* [*Early education, care and child-rearing. What can Switzerland learn?*] (pp. 197–217). Zürich, Switzerland: Rüegger Verlag.

Egeland, B., & Hiester, M. (1995). The long-term consequences of infant day-care and mother-infant attachment. *Child Development, 66*, 474–485.

Eisner, M., Murray, J., Ribeaud, D., Topcuoglu, T., Kazemian, L., & Besemer, S. (2009). The event history calendar as an instrument for longitudinal criminological research. *Monatsschrift für Kriminologie und Strafrechtsreform (Special Issue "International Longitudinal Research in Criminology"), 92*, 137–159.

Eisner, M., & Ribeaud, D. (2005). A randomised field experiment to prevent violence. *European Journal of Crime, Criminal Law and Criminal Justice, 13*, 27–43.

Eisner, M., & Ribeaud, D. (2007). Conducting a criminological survey in a culturally diverse context. *European Journal of Criminology, 4*, 271–298.

European Child Care and Education (ECCE) – Study Group (1999). *School-Age Assessment of Child Development: Long-term Impact of Pre-school Experiences on School Success, and Family-School Relationships. Final Report for Work Package #2*. Retrieved from http://www.uni-amberg.de/fileadmin/uni/fakultaeten/ppp_lehrstuehle/elementarpaedagogik/Team/Rossbach/Ecce_Study_Group.pdf, 19.10.2010.

Field, T. (1991). Quality infant day-care and grade school behavior and performance. *Child Development, 62*, 863–870.

Goldstein, N. E., Arnold, D. H., Rosenberg, J. L., Stowe, R. M., & Ortiz, C. (2001). Contagion of aggression in day care classrooms as a function of peer and teacher responses. *Journal of Educational Psychology, 93*, 708–719.

Han, W-J., Waldfogel, J., & Brooks-Gunn, J. (2001). The effects of early maternal employment on later cognitive and behavioral outcomes. *Journal of Marriage and the Family, 63*, 336–354.

Harvey, E. (1999). Short-term and long-term effects of early parental employment on children of the National Longitudinal Survey of Youth. *Developmental Psychology, 35,* 445–459.

Joshi, H., & Verropolou, G. (2000). *Maternal employment and child outcomes. Analysis of two birth cohort studies*. London: The Smith Institute.

Karasz, A. (2005). Cultural differences in conceptual models of depression. *Social Science and Medicin, 60*, 1625–1635.

Kleinman, A. (2004). Culture and depression. *New England Journal of Medicine, 351*, 951–953.

Linares Scott, T. J., Short, E. J., Singer, L. T., Russ, S. W., & Minnes, S. (2006). Psychometric properties of the Dominic Interactive assessment: A computerized self-report for children. *Assessment, 13*, 16–26.

Lösel, F., Beelmann, A., Stemmler, M., & Jaursch, S. (2006). Prävention von Problemen des Sozialverhaltens im Vorschulalter. Evaluation des Eltern- und Kindertrainings EFFEKT.

[Prevention of problems in social behavior at pre-school age. Evaluation of the parent- and child-training EFFEKT]. *Zeitschrift für Klinische Psychologie und Psychotherapie, 35*, 127–139.

McCartney, K., Burchinal, M., Clarke-Stewart, K. A., Bub, K. L., Owen, M. T., & Belsky, J. (2010). Testing a series of causal propositions relating time in child care to children's externalizing behavior. *Developmental Psychology, 46*, 1–17.

MecoP/INFRAS (2007). *Familienergänzende Kinderbetreuung und Erwerbsverhalten von Haushalten mit Kindern* [*External childcare and employment decisions in households with children.* (Studienreihe Vereinbarkeit von Beruf und Familie Nr. 3). Bern: SECO.

Melhuish, E., Quinn, L., Hanna, K., Sylva, K., Siraj-Blatchford, I., Sammons, P., et al. (2006). *Pre-School Experience and Social/Behavioural Development At the End of Year 2 of Primary School. Technical Paper No. 9*.

Murray, J. (2007). *Event History Calendars in z-proso*: z-proso (internal report).

NICHD Early Child Care Research Network. (1997a). The effects of infant child care on infant-mother attachment security: Results of the NICHD study of early child care. *Child Development*, *68*, 860–879.

NICHD Early Child Care Research Network. (1997b). Familial factors associated with the characteristics of nonmaternal care for infants. *Journal of Marriage and the Family, 59*, 389-408.

NICHD Early Child Care Research Network. (1999). Child care and mother-child interaction in the first three years of life. *Developmental Psychology, 35*, 1399–1413.

NICHD Early Child Care Research Network. (2001). Child-care and family predictors of preschool attachment and stability from infancy. *Developmental Psychology*, 37, 847–862.

NICHD Early Child Care Research Network. (2002). Child-care structure -> process -> outcome: Direct and indirect effects of child-care quality on young children's development. *Psychological Science, 13*, 199–206.

NICHD Early Child Care Research Network. (2003a). Does amount of time spent in child care predict socioemotional adjustment during the transition to kindergarten? *Child Development, 74*, 976–1005.

NICHD Early Child Care Research Network. (2003b). Does quality of child care affect child outcomes at age 4 ½? *Developmental Psychology, 39*, 451–469.

NICHD Early Child Care Research Network. (2004). Type of child care and children's development at 54 months. *Early Childhood Research Quarterly, 19*, 203–230.

Pagani, L. S., Japel, C., Vaillancourt, T., Côté, S., & Tremblay, R. E. (2008). Links between life course trajectories of family dysfunction and anxiety during middle childhood. *Journal of Abnormal Child Psychology, 36*, 41–53.

Peisner-Feinberg, E. S., Burchinal, M. R., Clifford, R. M., Culkin, M. L., Howes, C., Kagan, S. L., et al. (2001). The relation of preschool child-care quality to children's cognitive and social developmental trajectories through second grade. *Child Development, 72*, 1534–1553.

Perren, S., Wyl, A. v., Stadelmann, S., Bürgin, D., & Von Klitzing, K. (2006). Associations between behavioral/emotional difficulties in kindergarten children and the quality of their peer relationships. *Journal of American Academy of Child & Adolescent Psychiatry, 45*, 867–876.

Pierrehumbert, B., Ramstein, T., Karmaniola, A., & Halfon, O. (1996). Child care in the preschool years: Attachment, behaviour problems and cognitive development. *European Journal of Psychology of Education, 11,* 201–214.

Rutter, M. A. (1967). A children's behaviour questionnaire for completion by teachers: Preliminary findings. *Journal of Child Psychology and Psychiatry, 8*, 1–11.

Sammons, P., Sylva, K., Melhuish, E., Siraj-Blatchford, I., Taggart, B., Barreau, S., et al. (2007). *Influences on Children's Development and Progress in Key Stage 2: Social/behavioural outcomes in Year 5*. London: Institute of Education, University of London.

Schüpbach, M. (2010). *Ganztägige Bildung und Betreuung im Primarschulalter. Qualität und Wirksamkeit verschiedener Schulformen im Vergleich* [*Full-time education and care in primary school age. Comparing quality and effectiveness of different school types*]. Wiesbaden: VS.

Shelton, K. K., Frick, P. J., & Wootton, J. (1996). Assessment of parenting practices in families of elementary school-age children. *Journal of Clinical Child Psychology, 25*, 317–329.

Shojaei, T., Wazana, A., Pitrou, I., Gilbert, F., Bergeron, L., Valla, J.-P., et al. (2009). Psychometric properties of the Dominic Interactive in a large French sample. *Canadian Journal of Psychiatry, 54*, 767–776.

Stadt Zürich. (2010). *Report Familienergänzende Kinderbetreuung 2010. Leistungen 2009* [*Report external childcare 2010. Accomplishments 2009*]. Zürich, Switzerland: Stadt Zürich, Sozialdepartement.

Stamm, M. (2010). *Frühkindliche Bildung, Betreuung und Erziehung* [*Early education, care and child-rearing*]. Bern: Haupt Verlag.

Tremblay, R. E., Loeber, R., Gagnon, C., Charlebois, P., Larivée, S., & LeBlanc, M. (1991). Disruptive boys with stable and unstable high fighting behavior patterns during junior elementary school. *Journal of Abnormal Child Psychology, 19*, 285–300.

Tremblay, R. E., Pihl, R. O., Vitaro, F., & Dobkin, P. L. (1994). Predicting early onset of male antisocial behavior from preschool behavior. *Archives of General Psychiatry, 51*, 732–739.

Tremblay, R. E., Vitaro, F., Gagnon, C., Piché, C., & Royer, N. (1992). A prosocial scale for the Preschool Behaviour Questionnaire: Concurrent and predictive correlates. *International Journal of Behavioral Development, 15*, 227–245.

UNICEF (2008). *The Child Care Transition. A League Table of Early Childhood Education and Care in Economically Advanced Countries*. Unnocenti Report Care 8 Florence: UNICEF Innocentri Research Centre.

Valla, J.-P., Bergeron, L., Bérubé, H., Gaudet, N., & St-Georges, M. (1994). A structured pictorial questionnaire to assess DSM-III-R-based diagnoses in children (6–11 years): Development, validity, and reliability. *Journal of Abnormal Child Psychology, 22*, 403–423.

Valla, J.-P., Bergeron, L., & Smolla, N. (2000). The Dominic-R: A pictorial interview for 6- to 11-year-old children. *Journal of the American Academy of Child and Adolescent Psychiatry, 39*, 85–93.

Vandell, D. L. (2004). Early child care: The known and the unknown. *Merrill-Palmer Quarterly, 50*, 387–414.

Vandell, D. L., Belsky, J., Burchinal, M., Steinberg, L., Vandergrift, N., & NICHD Early Child Care Research Network (2010). Do effect of early child care extend to age 15 years? Results from the NICHD study of early child care and youth development. *Child Development, 81,* 737–756.

Vandell, D. L., & Corasaniti, M. A. (1990). Variations in early child care: Do they predict subsequent social, emotional, and cognitive differences? *Early Childhood Research Quarterly, 5*, 555–572.

Verhulst, F., Koot, H., & Ende, J. (1994). Differential predictive value of parents' and teachers' reports of children's problem behaviors: A longitudinal study. *Journal of Abnormal Child Psychology, 22*, 531–546.

Waldfogel, J. (2002). Child care, women's employment, and child outcomes. *Journal of Population Economics, 15,* 527–548.

Weir, K., & Duveen, G. (1981). Further development and validation of the Prosocial Behaviour Questionnaire for use by teachers. *Journal of Child Psychology and Psychiatry, 22*, 357–374.

Weismann, M. M., Bland, R. C., Canino, G. J., Faravelli, C., Greenwald, S., Hwu, H. et al. (1996). Cross-national epidemiology of major depression and bipolar disorder. *The Journal of the American Medical Association, 276*, 293–299

Widmer, F., Gabriel, T., & Grubenmann, B. (2009). *Säuglinge und Kleinstkinder in Kindertagesstätten in der Stadt Zürich* [*Infants and very young children in day care centers in the city of Zurich*] (Edition Sozialpraxis Nr. 4). Zürich: Sozialdepartement der Stadt Zürich.

Tables

Table 1. Distribution of dependent variables.

	N	Mean	Standard deviation	Minimum	Maximum
AGGR	1212	.00	.66	-1.09	3.75
ADHD	1212	.00	.69	-1.36	2.50
NAEX	1212	.00	.67	-1.13	3.60
ANXDEP	1212	.00	.62	-1.47	2.29

Table 2. Summary statistics of control variables.

	N	Mean	Standard deviation	Minimum	Maximum	Metric
Male	1225	.52	.50	.00	1.00	1 if true, 0 if not
Single parenthood	1222	.04	.21	.00	1.00	1 if true, 0 if not
Parental separation	1220	.13	.34	.00	1.00	1 if true, 0 if not
Parental criminality	1225	.05	.22	.00	1.00	1 if true, 0 if not
Parental conflict	1225	.21	.41	.00	1.00	1 if true, 0 if not
Maternal depression	1225	.20	.40	.00	1.00	1 if true, 0 if not
Financial difficulties	1225	.17	.37	.00	1.00	1 if true, 0 if not
Age of mother at birth child	1215	30.27	5.38	16.00	44.00	
Negative parenting	1220	1.63	.29	1.00	2.68	
Presence of siblings	1223	.78	.41	.00	1.00	1 if true, 0 if not
Alcohol consumption of mother during pregnancy	1210	.46	.92	.00	5.00	
Migrant background	1218	.46	.50	.00	1.00	1 if true, 0 if not
Household income	1122	5.97	1.96	1.00	10.00	
Parental education	1217	6.40	2.96	1.00	10.00	

Table 3. Results of analyses on aggression. Reported values are unstandardised coefficients, standard errors, p-values, and standardised Beta's.

	AGGR		
	Model 1: Base	Model 2: Type of care	Model 3: Adds covariates
External care	.066** (.014) p=.000 Beta=.146		
Individual care		.007 (.020) p=.727 Beta=.016	-.010 (.018) p=.591 Beta= -.015
Group-based care		.122** (.017) p=.000 Beta=.196	.092** (.022) p=.000 Beta= .152
Male			.236** (.038) p=.000 Beta= .183
Single parenthood			.190 (.114) p=.102 Beta= .063
Parental separation			.013 (.091) p=.888 Beta= .007
Parental criminality			.159 (.083) p=.061 Beta= .057
Parental conflict			.034 (.053) p=.520 Beta= .022
Maternal depression			.032 (.044) p=.477 Beta= .020
Financial difficulties			.096 (.048) p=.051 Beta= .056
Age of mother at birth child			-.007* (.003) p=.049 Beta= -.055
Negative parenting			.529** (.060) p=.000 Beta= .238
Presence of siblings			-.020 (.051) p=.700 Beta= -.013
Alcohol consumption of mother during pregnancy			.036 (.018) p=.051 Beta= .053
Migrant background			-.130** (.048) p=.009 Beta= -.100
Household income			-.001 (.012) p=.915 Beta= -.004
Parental education			.006 (.007) p=.398 Beta= .029
Constant	-.091** (.032) p=.006	-.101** (.032) p=.002	-.880** (.169) p=.000
Number of respondents	1211	1211	1095

*$p<.05$ **$p<.01$*

Table 4. Results of analyses on ADHD. Reported values are unstandardised coefficients, standard errors, p-values, and standardised Beta's.

	ADHD		
	Model 1: Base	Model 2: Type of care	Model 3: Adds covariates
External care	.069** (.016) p=.000 Beta=.147		
Individual care		.039 (.026) p=.134 Beta=.064	.016 (.022) p=.467 Beta= .025
Group-based care		.095** (.018) p=.000 Beta=.146	.050* (.019) p=.010 Beta= .078
Male			.248** (.037) p=.000 Beta= .184
Single parenthood			.071 (.094) p=.452 Beta= .022
Parental separation			.081 (.080) p=.316 Beta= .042
Parental criminality			.062 (.082) p=.452 Beta= .021
Parental conflict			-.008 (.061) p=.898 Beta= -.005
Maternal depression			.057 (.047) p=.233 Beta= .035
Financial difficulties			.029 (.050) p=.564 Beta= .016
Age of mother at birth child			-.015** (.004) p=.000 Beta= -.117
Negative parenting			.586** (.061) p=.000 Beta= .250
Presence of siblings			-.204** (.057) p=.001 Beta= -.125
Alcohol consumption of mother during pregnancy			.034 (.021) p=.115 Beta= .047
Migrant background			.017 (.049) p=.732 Beta= .012
Household income			-.011 (.012) p=.359 Beta= -.032
Parental education			-.018* (.008) p=.025 Beta= -.078
Constant	-.094** (.033) p=.006	-.096** (.032) p=.004	-.406* (.166) p=.018
Number of respondents	1211	1211	1095

*$p<.05$ **$p<.01$

Table 5. Results of analyses on non-aggressive externalizing behaviour. Reported values are unstandardised coefficients, standard errors, p-values, and standardised Beta's.

	NAEX		
	Model 1: Base	Model 2: Type of care	Model 3: Adds covariates
External care	.066** (.014) p=.000 Beta=.142		
Individual care		.027 (.021) p=.201 Beta=.045	.011 (.019) p=.562 Beta= .017
Group-based care		.103** (.017) p=.000 Beta=.164	.060** (.019) p=.002 Beta= .097
Male			.362** (.037) p=.000 Beta= .276
Single parenthood			.099 (.123) p=.424 Beta= .032
Parental separation			.065 (.070) p=.356 Beta= .034
Parental criminality			.117 (.095) p=.224 Beta= .041
Parental conflict			.028 (.051) p=.593 Beta= .017
Maternal depression			.069 (.047) p=.146 Beta= .043
Financial difficulties			.139* (.058) p=.020 Beta= .079
Age of mother at birth child			-.008** (.003) p=.009 Beta= -.066
Negative parenting			.620** (.062) p=.000 Beta= .272
Presence of siblings			-.116* (.058) p=.049 Beta= -.073
Alcohol consumption of mother during pregnancy			.025 (.019) p=.194 Beta= .036
Migrant background			-.145** (.048) p=.004 Beta= -.110
Household income			-.013 (.012) p=.267 Beta= -.040
Parental education			-.001 (.007) p=.921 Beta= -.003
Constant	-.092** (.030) p=.003	-.099** (.029) p=.001	-.845** (.163) p=.000
Number of respondents	1211	1211	1095

*$p<.05$ **$p<.01$

Table 6. Results of analyses on anxiety and depression. Reported values are unstandardised coefficients, standard errors, p-values, and standardised Beta's.

	ANXDEP		
	Model 1: Base	Model 2: Type of care	Model 3: Adds covariates
External care	.054** (.013) p=.000 Beta=.125		
Individual care		.034* (.017) p=.047 Beta=.060	.023 (.018) p=.199 Beta= .039
Group-based care		.148** (.051) p=.005 Beta=.251	.127** (.045) p=.006 Beta= .218
Squared group-based care		-.025 (.016) p=.124 Beta=-.142	-.029* (.013) p=.034 Beta= -.168
Male			-.078* (.037) p=.042 Beta= -.063
Single parenthood			.138 (.076) p=.077 Beta= .048
Parental separation			.061 (.078) p=.438 Beta= .034
Parental criminality			.138 (.085) p=.113 Beta= .051
Parental conflict			.085 (.064) p=.192 Beta= .057
Maternal depression			.122* (.047) p=.012 Beta= .082
Financial difficulties			.029 (.044) p=.508 Beta= .018
Age of mother at birth child			-.011** (.003) p=.002 Beta= -.098
Negative parenting			.376** (.061) p=.000 Beta= .176
Presence of siblings			-.112* (.047) p=.021 Beta= -.075
Alcohol consumption of mother during pregnancy			.026 (.021) p=.239 Beta= .039
Migrant background			.115** (.039) p=.004 Beta= .093
Household income			-.025* (.011) p=.031 Beta= -.078
Parental education			.008 (.006) p=.135 Beta= .040
Constant	-.074** (.026) p=.006	-.093** (.027) p=.001	-.255 (.130) p=.054
Number of respondents	1211	1211	1095

*$p<.05$ **$p<.01$*

Table 7. Adjusted means (se) of problem behaviour for four categories of group-based childcare quantity.

Average quantity of childcare received	AGGR	ADHD	NAEX	ANXDEP
Less than half a day (n = 626)	-.053 (.024)	-.043 (.025)	-.045 (.024)	-.054 (.024)
0.5 - 1.5 days (n = 231)	-.017 (.039)	-.006 (.041)	.009 (.038)	.053 (.039)
1.5 – 2.5 days (n = 128)	.094 (.053)	.089 (.056)	.094 (.052)	.081 (.053)
More than 2.5 days (n = 110)	.241 (.058)	.085 (.061)	.110 (.057)	.028 (.057)

Note. Means are adjusted for average quantity of individual care, sex, single parenthood, parental separation, parental criminality, parental conflict, maternal depression, financial problems, age of mother at birth, negative parenting, presence of siblings, alcohol consumption of mother during pregnancy, migrant background, income, and parental education.

Table 8. Adjusted proportions (se) of 'high-rate' problem behaviour (scores of at least 1 SD above the mean) for four categories of group-based childcare quantity.

Average quantity of childcare received	AGGR	ADHD	NAEX	ANXDEP
Less than half a day (n = 626)	.099 (.141)	.128 (.128)	.101 (.143)	.120 (.129)
0.5 - 1.5 days (n = 231)	.136 (.193)	.141 (.192)	.119 (.204)	.159 (.183)
1.5 – 2.5 days (n = 128)	.144 (.251)	.138 (.254)	.119 (.267)	.189 (.232)
More than 2.5 days (n = 110)	.275 (.234)	.156 (.264)	.163 (.267)	.162 (.260)

Note. Means are adjusted for average quantity of individual care, sex, single parenthood, parental separation, parental criminality, parental conflict, maternal depression, financial problems, age of mother at birth, negative parenting, presence of siblings, alcohol consumption of mother during pregnancy, migrant background, income, and parental education.

Table 9. Relationship of timing of group-based childcare and child problem behaviour. Reported values are unstandardised coefficients, standard errors, p-values, and standardised Beta's (n=1095).

	AGGR	ADHD	NAEX	ANXDEP
Cumulative predictors				
Age 0 (first year of life)	.041 (.037) p=.281 Beta= .038	.018 (.042) p=.674 Beta= .016	.041 (.038) p=.281 Beta= .037	-.003 (.037) p=.946 Beta= -.002
Age 0-2	.060** (.022) p=.009 Beta= .088	.030 (.021) p=.163 Beta= .042	.046* (.022) p=.039 Beta= .065	.022 (.020) p=.276 Beta= .034
Age 0-4	.066** (.021) p=.003 Beta= .108	.036 (.018) p=.057 Beta= .056	.043* (.019) p=.025 Beta= .069	.027 (.018) p=.144 Beta= .046
Age 0-7	.095** (.022) p=.000 Beta= .156	.046* (.019) p=.017 Beta= .072	.059** (.018) p=.002 Beta= .095	.032 (.019) p=.089 Beta= .055
Unique predictors				
Age 0 (first year of life)	-.023 (.059) p=.701 Beta= -.021	-.013 (.059) p=.825 Beta= -.011	-.003 (.045) p=.943 Beta= -.003	-.041 (.048) p=.401 Beta= -.039
Age 1-2	.030 (.032) p=.358 Beta= .056	.010 (.031) p=.757 Beta= .017	.029 (.024) p=.239 Beta= .052	.023 (.025) p=.370 Beta= .044
Age 3-4	-.003 (.021) p=.902 Beta= -.006	.013 (.022) p=.572 Beta= .028	-.009 (.021) p=.658 Beta= -.021	.009 (.018) p=.634 Beta= .021
Age 5-7	.066** (.015) p=.000 Beta= .154	.020 (.016) p=.201 Beta= .045	.037* (.018) p=.039 Beta= .086	.008 (.012) p=.491 Beta= .021

**p<.05 **p<.01*

Note: All models include the control variables male, single parenthood, parental separation, parental criminality, parental conflict, maternal depression, financial difficulties, age of mother at birth child, negative parenting, presence of sibling, alcohol consumption of mother during pregnancy, migrant background, household income and parental education

Appendix. Results per informant. Reported values are unstandardised coefficients, standard errors, and p-values.

	Parent reported problem behaviour	Teacher reported problem behaviour	Child reported problem behaviour
AGGR			
Individual care	.004 (.010) p=.688	-.007 (.017) p=.679	-.005 (.005) p=.307
Group-based care	.025 (.013) p=.065	.086** (.023) p=.001	.017** (.006) p=.005
ADHD			
Individual care	.024 (.020) p=.248	.039 (.027) p=.157	-.006 (.006) p=.286
Group-based care	.029 (.018) p=.105	.082** (.025) p=.002	.004 (.007) p=.530
NAEX			
Individual care	.008 (.011) p=.431	.012 (.014) p=.400	-.003 (.005) p=.570
Group-based care	.032** (.010) p=.002	.041** (.014) p=.005	.003 (.006) p=.638
ANXDEP			
Individual care	.011 (.014) p=.420	-.002 (.021) p=.911	.011 (.007) p=.093
Group-based care	.097* (.037) p=.012	.030 (.049) p=.543	.031 (.019) p=.099
Group-based care squared	-.027* (.010) p=.010	.009 (.017) p=.617	-.009 (.006) p=.127

**p<.05 **p<.01*

Note: All models include the control variables male, single parenthood, parental separation, parental criminality, parental conflict, maternal depression, financial difficulties, age of mother at birth child, negative parenting, presence of sibling, alcohol consumption of mother during pregnancy, migrant background, household income and parental education

Endnotes

[i] The lower cross-informant reliability for ANXDEP is likely due to its lower visibility compared to externalizing behaviours, leading to different interpretations by different informants.

[ii] This is likely to be an interviewer effect. Some interviewers were more likely than others to fail to note the number of days of childcare received. Interviewers were allocated to the respondents according to language group. In turn, language group correlates with ethnicity, income, and also with the reporting of depression (e.g. Karasz, 2005; Kleinman, 2004; Weismann, Bland, Canino, Faravelli, Greenwald, Hwu, et al., 1996).

[iii] We preferred mean imputation over listwise deletion. Listwise deletion had meant that each quarter in which an unknown amount of external childcare was received (but in which we knew that external childcare *was* received), had effectively been recoded to zero. E.g., if a child received no childcare in 23 quarters, and received an unknown amount of childcare for 3 quarters, the recoding of these 3 quarters to system missing would result in an average of zero days of childcare per week across the life-course, even though we knew that (s)he received at least some childcare. We re-performed all analyses using listwise deletion, but results were very similar. Multiple imputation was not computationally feasible, given that the childcare measures were constructed from five types of childcare (by family, neighbours and acquaintances, daycare mother, centre, and after-school) which would have had to be imputed separately for each quarter of the child's life.

[iv] Potential explanations are that teacher reports may be less affected by social desirability than parent reports, and that they may be more adequate than reports from 7-year-old children.

[v] Estimates were calculated by dividing the unstandardised regression coefficients by the standard deviation of the dependent variables.